Med.Sci.Educ. (2017) 27:237–242
DOI 10.1007/s40670-017-0380-x

ORIGINAL RESEARCH

Student Interaction in Small Private Online Courses

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Published online: 14 February 2017

Abstract
Introduction Social interaction is key in educational success. In online education, the creation of social interaction may be a challenge. This observational study evaluated to what extent social interactions occur during small private online courses (SPOCs).
Methods Discussion forums of four courses of the UMC Utrecht's international Master's Program Epidemiology were assessed and posts were categorized as either content specific, functional/technical, or social.
Results SPOCs at University Medical Center Utrecht showed substantial social interaction, creating involvement and student coherence, combined with students discussing and explaining content to each other. Interactions play a major role in SPOCs. Our results show that 43% of all discussion posts were social; 90% of social posts were initiated by students; and 94% was aimed at students.
Conclusion SPOCs appear to provide a sustainable answer to the increased demand for online higher education, with an environment suitable for students to learn, in agreement with the need for social interaction in higher education.

Keywords SPOC · Online education · Social interaction · Student interaction · Discussion forum

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Introduction

With the digital advances of the Internet, online education has rapidly invaded the educational world [1–4]. In 2014, 14% of higher education students in the USA followed education that was delivered entirely online, and 28% of higher education students took at least one online course [5]. In the last decade, online enrolment increased by 27%, from 2.3 to 2.9 million students [5, 6]. Every year the rate of growth increases, with 3.7% growth in 2013 and 3.9% in 2014.

The emergence of online education such as massive open online courses (MOOCs) and other concepts of complete online education may result in the deprioritization of student-centeredness [7]. Yet, developments in higher education have led to student-centered approaches where action of students and interaction between students are keys [8].

Social cognitive theory shows that social interaction, between teachers and learners and among learners, is significantly affects student learning and improves student motivation for course completion. Social and peer acceptability are powerful in education and increase the likelihood of adopting effective learning behaviors [9]. This means that for most students desiring to learn, they need to feel part of a group of peers. In the 1970s, Tinto delineated involvement of students and academic and social coherence as key institutional conditions to support student retention in schools and courses [10]. Feedback, for instance, is considered one of the main factors in student learning. The use of feedback has significant potential to help students connect to course materials, peers, and teachers [11]. The quality of feedback directly affects the quality of education [12].

Furthermore, social cognitive theory states that self-regulation is a key to personal agency [13], which is also necessary for learning. An advantage of online education, in contrast to face-to-face education, is that students actually can self-regulate when and where they study and often also the pace in which they study.

However, full self-regulation may be counter-productive. To achieve involvement of students and academic and social coherence [10] in online education, a social space needs to be formed with interaction on a content level and on a social level between teachers and students as well as between peers.

Creating such social interaction to stimulate learning is a major challenge in online education [14]. It is widely known that discussion forums play a major role in online learning, since these create opportunities for interaction [15–19]. However, we do not know whether this also really induces social interaction and social coherence between students and teachers and among peers. In order to create a social space for students to facilitate collaborative learning, it may be helpful to keep classes small, enabling teachers and students to have meaningful, task-related interaction. Group development resulting in a social space with trust, a sense of community, and strong interpersonal relationships might help in creating social interaction to stimulate learning [20].

University Medical Center Utrecht offers online education as SPOCs or small private online courses [21]. The acronym is derived from their distinction from MOOCs (massive online open courses). These SPOCs have distinct characteristics, as shown in Box 1.

Box 1 Characteristics of SPOCs

- Small scaled; a maximum of 20 students per course run can attend.
- Students must register and prerequisites apply, dependent on the course aim and learning goals,
- Students pay a fee to follow the course, and they get an official certificate and credits upon passing the course.
- All teaching takes place online, either synchronously or asynchronously, but without face to face meetings.
- All SPOC courses have teachers providing feedback on a content level.
- All courses have a trained e-moderator guiding students through the course and serving as a first resource for students.
- E-moderators stimulate students to actively participate in the courses, which is a requirement to complete the course.

Interaction at group level as well as individual feedback plays a major role in these SPOCs. The SPOCs use Moodle as the electronic learning environment or learning management system, specifically designed for this online education (Elevate Health BV ©) with a focus on social aspects of the learning environment. This, in combination with the characteristics mentioned in Box 1, is part of the didactic philosophy of Elevate Health BV ©. The learning environment uses asynchronous threaded discussion forums. These include a "like-button" with which students can express their appreciation of posts by peers and teachers. However, facilitating opportunities for social interaction through a learning environment consistent with the theoretical aspects of social cognitive learning does not guarantee such learning. Students as well as teachers need to actively create an atmosphere where learning can take place. In the SPOCs, e-moderators play an important role in stimulating the students to actively participate in the course and to interact.

In this observational study, our aim was to evaluate to what extent social interactions occur during online SPOCs in order to assess if these SPOCs create an environment where students engage in social cognitive learning. We investigated this in UMC Utrecht's international postgraduate Master's Program in Epidemiology.

Methods

We evaluated the interaction among students and between students and teachers within the electronic learning environment of four courses that were delivered between September 2015 and March 2016. Included were two course runs of two different postgraduate courses: Introduction to Epidemiology and Clinical Epidemiology. In total, 71 students participated. There was little overlap of student enrollment in the four courses; only 3 out of 71 students participated in two different courses. Of the 71 students, most (61%) were from the Netherlands, 20% from other European countries, 7% from Asia, and 4% from Africa, 4% from North America and 4% from South America. The students in these postgraduate courses all had a higher education Master's degree in the field of Life Sciences and Health and a good proficiency in English. The mean age was 32 (±6.5), ranging from 23 to 50 years of age.

The online courses were divided into different learning units, starting with an introduction, followed by the different topics, and finally, an exam unit and an evaluation unit. Every unit was comprised of different learning tasks. Each learning task was opened in a separate screen and for every learning task a discussion forum was available for students and teachers to discuss that part of the learning unit. These discussion forums had a free format and were open for everyone in the course to use. Anyone could start a new thread in each discussion forum, or reply to earlier posts. All posts were read by the e-moderator, who either guided the students or notified the teacher that he or she needed to engage in the discussion.

To increase interaction, in order to motivate students to reflect on what they have learned, teachers could make discussion forum posts in a course obligatory. Of the 190 included learning tasks, students were required to participate in the forum discussion for 15 learning tasks (8%); students were either required to post a topic or they were required to react to posts of fellow students in order to pass. Separate credits were not awarded for taking part in discussion forums. Furthermore, there was a general news forum for the whole course, mainly used by the teachers and e-moderators to inform the students about technical or organizational issues. All interactions in all discussion forums of these four courses were tracked and labeled. Posts were analyzed directly in the learning environment and analysis results entered in a SPSS database. All labeling was done by one researcher (SU) to avoid

Table 1 Characteristics of the SPOCs

Course	Name	Duration and study load	Number of students (% drop-out)	% Male students	Student grade[a] (mean ± sd)	Student satisfaction[a] (mean ± sd)
1	Clinical Epidemiology	3 weeks of 14 h	21 (10)	24	6.2 ± 0.8	7.5 ± 0.2
2	Clinical Epidemiology	3 weeks of 14 h	12 (0)	42	5.1 ± 1.1	7.7 ± 2.1
3	Introduction to Epidemiology	3 weeks of 14 h	15 (7)	7	6.7 ± 1.3	8.1 ± 0.4
4	Introduction to Epidemiology	3 weeks of 14 h	23 (9)	22	7.5 ± 1.0	7.7 ± 1.8

[a] Grades and satisfaction scores range from 1 to 10, the higher the better. A grade of 5.5 is required to pass the course

inconsistencies. To check the reliability of the labeling, another researcher (RF) also labeled a random selection of 10% of the posts. The percentage agreement was 93%. We registered the actors in the discussion, who initiated a post, and at whom the post was aimed and who started the discussion and who replied. Actors could be a teacher, an e-moderator or a student. We tracked the number of discussions and the number of posts per discussion. Interactions in the learning environment were labeled as functional/technical, content specific or social. Functional/technical interactions regarded instructional interaction about the use of the learning environment, questions about technical issues or questions about instructions (e.g., which pages to read, where to find a recommended video, when and how to hand in assignments). Content-specific interaction included all interactions about the topics of the course. Social interaction included interactions with only social content and the posted "likes" of posts in the discussions.

Box 2 shows an example of the three different categories of posts, as found in one discussion.

Box 2 Three categories of posts–examples within one discussion

Content
X: "Two hundred words exactly; the arguments are mixed together–in back and forth style. What do you think?
This study does not indicate a significant association between self-harm, suicidal thoughts, or depression with varenicline compared with those prescribed other smoking cessation products. While the study is not conclusive, and warrant further research, it does provide a good starting point in assessing the potential relationship between varenicline and self harm."
Social
Y: "X, that is very nicely summed up and within the word limit."
Functional/technical
Z: "I have submitted our contra text in text box 3. Final word count"

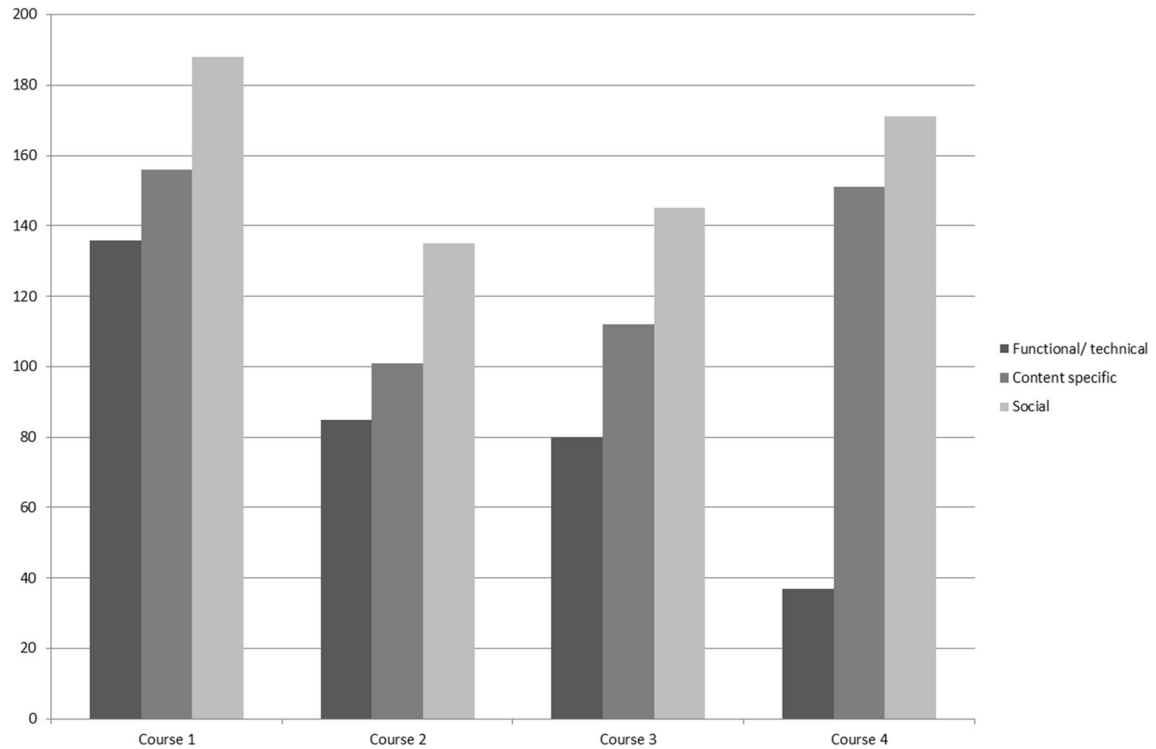

Fig. 1 Number of posts and sort post per course. The *bars* show the number of posts in the four courses divided by the category of the posts

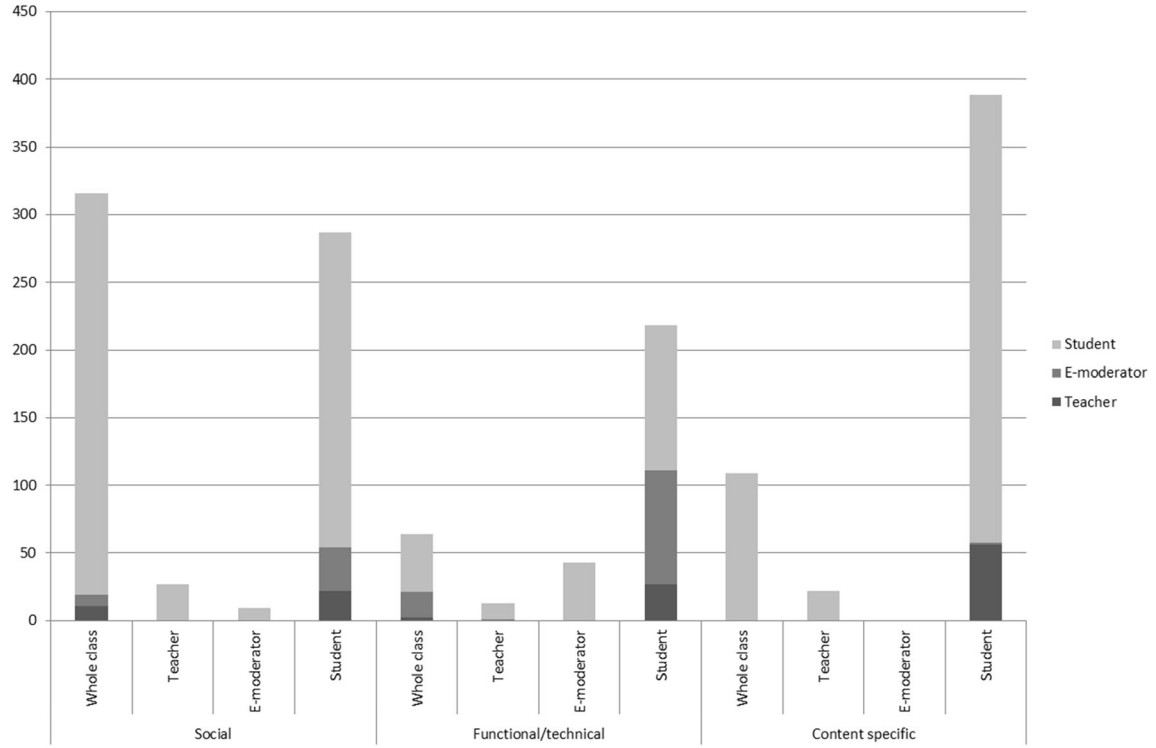

Fig. 2 Number of posts from students, e-moderators, and teachers. *Y axis* shows the number of posts from either students, e-moderators, or teachers; while on the *x axis*, the persons whom the post was aimed at divided by the category of the post

Results

Table 1 shows the characteristics of the courses that were included. The four courses were comparable in duration, study load, student number, and grades.

In total, we found about 1500 interaction posts across the four courses, in 575 discussions. Of the posts, 43% were social interactions, followed by 35% content-specific interaction posts. Figure 1 shows these distinctions per course. The number of social interactions was always highest. Course 1 had a relatively large number of functional interactions (a new form of online debate was introduced, leading to many technical questions and explanations), which increased the total number of interactions for that course, compared to the other courses.

Figure 2 shows that most interaction occurred between students and these were primary social interactions. Nine of every ten social interactions were generated by the students, and 94% of all social interactions were aimed at the students (including social posts aimed at the whole class).

Content-specific interactions were, as expected, mostly aimed at students (96%). More striking is that 89% of these content posts were also generated by students and only 11% by the teachers. Students were significant in helping each other learn by explaining content to each other.

Each discussion forum was open for students to either start a new discussion thread or to rely to posts of others. When looking at discussion threads, Table 2 shows that the mean number of responses per discussion was 1.6 (±2.8), with a maximum number of 25 posts in one discussion thread. In discussion threads, the mean number of participants was 2.0 (±1.4), with a median of 1 and a maximum number of 11 participants. Students initiated 95% of the discussion threads.

Of 575 discussions, 304 were single posts, i.e., a person posting a comment without reaction, i.e., without interaction. If we exclude these single posts, the mean number of posts per

Table 2 Mean number of responses and participants in SPOC discussion threads

	Including single posts ($N = 575$)			Excluding single posts ($N = 271$)		
	Mean ± standard deviation	Median	Range	Mean ± standard deviation	Median	Range
Number of responses	1.6 ± 2.8	0	0–25	3.4 ± 3.3	2	1–25
Number of participants	2.0 ± 1.4	1	1–11	3.1 ± 1.4	3	2–11

discussion increases to 3.4 (±3.3), with a median of 2 (Table 2 right columns). In these discussions, the mean number of participants was 3.1 (±1.4), with a median of 3 and a maximum of 11 participants.

On 15 discussion forums, students were obliged to actively participate. To assess whether this actually increased the interaction, we looked at the number of responses in the obligatory versus the voluntary forum posts. The average number of responses in voluntary forum discussions appeared much higher. In obligatory forums, the mean number of responses was 0.4 (±1.4), compared to 2.4 (±3.2) in voluntary discussions. Furthermore, 81% of posts in obligatory forums were single posts, not receiving any responses.

Discussion

This observational study shows that interactions play a major role in SPOCs. SPOCs of University Medical Center Utrecht show a large percentage of social interactions, creating involvement and student coherence, combined with students discussing about and explaining content to each other. We expect this to lead to highly motivated students, and the creation of an online environment where learning can take place. This was supported by relatively high student satisfaction rates and low drop-out percentages. Our results are in agreement with the findings of several other authors [15–17, 22]. All studies stress the importance of student interaction in discussion forums as an essential part of learning.

This study shows that in SPOCs social interaction does occur in large quantities. We did not assess the relationship between social interaction and learning. However, student grades and the percentage of students passing the course were comparable to on-campus versions of the same courses, which have been successfully run for over a decade. This also holds for student satisfaction rates, which together with achievement, suggest that the learning by students is comparable. In line with social cognitive theory [9], we can deduce that the nature of the online social environment of SPOCs is a factor that attributes to the learning of students.

It is known that small group sizes are related to more interaction in online discussion forums [22, 23]. We used SPOCs as small-scale online education. The concept of SPOCs may be an option for many programs, who intent to start online programs, or online runs of their face to face programs. In larger credit-bearing online programs, it may also be an option to split large groups into smaller discussion board groups, creating a comparable online social environment [23].

Interestingly, making forum posts obligatory does not increase the interaction around those posts, since the obligatory posts appeared to be mostly single posts without further interaction. However, we do not conclude that instructors should not include obligatory posts. They can function as stimulus for students to start posting, which then may lower the threshold of posting in voluntary discussions.

Student dropout rates (7%) in these SPOCs were comparable to the rates in the same on-campus courses, indicating involvement of students and academic and social coherence [11].

The categorization we used is comparable to that used by Ke and Kui, who distinguished Social, Knowledge (comparable to Content specific) and Regulation (comparable to functional/technical) in assessing online adult education [24]. Although we found that categorizing the discussion posts was possible in all cases, it did occur that a post could be labeled as two categories e.g., a combination of content and social. In that case, we chose the category containing the major message of the post. In most of these cases, content or functional posts included a social start or finish, which were therefore not labeled as social. This indicates that the social interaction will be more likely to be underestimated than overestimated in this study. In further studies, qualitative analysis techniques can be incorporated in order to asses and label discussion forum texts [25, 26].

Given the large increase in online education [5], our results show that SPOCs prove to be a sustainable concept, with an environment suitable for students to learn, in agreement with the need for social interaction in higher education.

Acknowledgements The authors would like to thank Carrie Chen for reviewing the manuscript.

Compliance with Ethical Standards

Competing Interests The authors declare that they have no competing interests.

Financial Competing Interests All authors declare that there are no financial competing interests.

Declaration of Interest The authors report no declaration of interest.

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